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ethidium monoazide bromide (EMA)

Description

Ethidium monoazide is a fluorescent photoafinity label that, after photolysis, binds covalently to nucleic acids both in solution and in cells that have compromised membranes. The fluorescence of ethidium monoazide is weak, but the intensity increases ~15-fold on binding to DNA with excitation/emission maxima of ~504/600 nm.

Catalog Number
E1374
Size
5 mg

List Price
(USD) 189.00

Specifications

General Specifications

Color:	Orange
Platform:	Flow Cytometer
Product Size:	5 mg
Detection Method:	Fluorescent
Cell Permeability:	Cell-Impermeant
Sub-Cellular Localization:	Nucleic Acids, Nucleus

Chemical Structures

ethidium monoazide bromide

Molecular Formula:

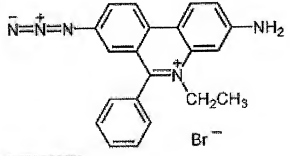
$C_{21}H_{18}BrN_5$

Molecular Weight:

420.3107

CAS Name/Number:

Phenanthridium, 3-amino-8-azido-5-ethyl-6-phenyl, bromide/ 58880-05-0



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Documents

Material Safety Data Sheets (MSDS)

- E1374

Certificates of Analysis (COA)

Molecular Probes Handbook

- Photoactivatable Reagents, Including Photoreactive Crosslinkers and Caged Probes—Section 5
- Nucleic Acid Stains—Section 8.1
- Viability and Cytotoxicity Assay Reagents—Section 15.2

Additional Information

Citations & References (96)

- **Novel pentablock copolymers for selective gene delivery to cancer cells.**

Authors
Zhang B, Kanapathipillai M, Bisso P, Mallapragada S,
Journal
Pharm Res (2009) 26:700-713
Product Usage
Labeling of poly(diethylaminoethylmethacrylate)/Pluronic F127 copolymers for visualization o microscopy.
ID:
PN67213

- **Analysis of HCV-specific T cells by flow cytometry.**

Authors
Shiina M, Rehermann B,
Journal
Methods Mol Biol (2009) 510:415-426
Product Usage
Flow cytometric analysis of HCV-specific T-cell proliferation.
ID:
PN67409

- **In vitro micronucleus assay scored by flow cytometry provides a comprehensive evaluatio**

Authors
Bryce SM, Bemis JC, Avlasevich SL, Dertinger SD
Journal
Mutat Res (2007) 630:78-91
ID:
PN58978

- **Cationic albumin-conjugated pegylated nanoparticles allow gene delivery into brain tumo**

Authors
Lu W, Sun Q, Wan J, She Z, Jiang XG
Journal
Cancer Res (2006) 66:11878-11887
ID:
PN58479

- **Selective removal of DNA from dead cells of mixed bacterial communities by use of ethidi**

Authors
Nocker A, Camper AK
Journal
Appl Environ Microbiol (2006) 72:1997-2004
ID:
PN59007

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LIVE/DEAD® Reduced Biohazard Cell Viability Kit #1 *green and red fluorescence* *100 assays*

Cat #
L7013
Size
1 kit
List Price
209.00
(USD)

SYTOX® Green nucleic acid stain - 5 mM solution in DMSO

Cat #
S7020
Size
250 µl
List Price
184.00
(USD)

Product Categories

- Nucleic Acid Cell Stains

Related Applications

- Cell Structure
- Cell Tracing & Tracking
- Cell Viability, Proliferation & Function

Related Products

- Nuclear Probes
- Structural Probes

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nuclear yellow (Hoechst S769121, trihydrochloride, trihydrate)

Description

Nuclear yellow (Hoechst S769121) exhibits excitation/emission maxima ~335/495 nm when bound to DNA.

Catalog Number
N21485
Size
10 mg

List Price
(USD) 105.00

Specifications

General Specifications

Color:	Yellow
Platform:	Fluorescence Microscope
Product Size:	10 mg
Detection Method:	Fluorescent
Cell Permeability:	Cell-Impermeant
Sub-Cellular Localization:	Nucleic Acids, Nucleus

Chemical Structures

nuclear yellow

Molecular Formula:

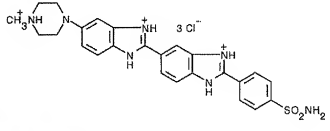
$C_{25}H_{34}Cl_3N_7O_5S$

Molecular Weight:

651.01

CAS Name/Number:

Benzenesulfonamide, 4-[5-(4-methyl-1-piperazinyl)[2,5'-bi-1H-benzimidazol]-2'-yl]-, trihydrochlorid



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Documents

Manuals & Protocols

- Hoechst Stains

Material Safety Data Sheets (MSDS)

- nuclear yellow (Hoechst S769121, trihydrochloride, trihydrate)

Certificates of Analysis (COA)

Molecular Probes Handbook

- Probes for the Nucleus—Section 12.5
- Nucleic Acid Stains—Section 8.1

Additional Information

Citations & References (189)

- **Specific heterochromatic banding of metaphase chromosomes using nuclear yellow.**

Authors
Pinna-Senn E, Lisanti JA, Ortiz MI, Dalmasso G, Bella JL, Gosálvez J, Stockert JC
Journal
Biotech Histochem (2000) 75:132-140
ID:
PN38454

- **The limbic zone of the rabbit and rat claustrum: a study of the claustrocingulate connecti transport of fluorescent tracers.**

Authors
Majak K, Kowiánski P, Morýs J, Spodnik J, Karwacki Z, Wisniewski HM
Journal
Anat Embryol (Berl) (2000) 201:15-25
ID:
PN39383

- **Bifurcating projections from the cerebellar fastigial neurons to the thalamic supragenicul**

Authors
Katoh YY, Arai R, Benedek G
Journal
Brain Res (2000) 864:308-311
ID:
PN41558

- **Oncogenic Ras induces p19ARF and growth arrest in mouse embryo fibroblasts lacking p cyclin D-dependent kinases.**

Authors
Groth A, Weber JD, Willumsen BM, Sherr CJ, Roussel MF
Journal
J Biol Chem (2000) 275:27473-27480
ID:
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- **Higher activities of acetylcholinesterase and choline acetyltransferase in jaw-opening tha**

Authors
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Journal
Arch Oral Biol (1999) 44:197-200
ID:
PN39382

Product Reviews (0)

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Size
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Cat #
I10291
Size
1 vial
List Price
263.00
(USD)

TO-PRO®-3 iodide (642/661) - 1 mM solution in DMSO

Cat #
T3605
Size
1 ml
List Price
255.00
(USD)

Product Categories

- Nucleic Acid Cell Stains

Related Applications

- Cell Structure
- Cell Tracing & Tracking

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propidium iodide

Description

Propidium iodide is a popular red-fluorescent nuclear and chromosome counterstain. Since propidium iodide is not permeant to live cells, it is also commonly used to detect dead cells in a population. This dye is also available in solution (P-3566).

Catalog Number
P1304MP
Size
100 mg

List Price
(USD) 119.00

Specifications

General Specifications

Color:	Red
Platform:	Flow Cytometer, Fluorescence Microscope
Product Size:	100 mg
Detection Method:	Fluorescent
Cell Permeability:	Cell-Impermeant

Sub-Cellular Localization: Cytoplasm & Cytosol

Chemical Structures

propidium iodide

Molecular Formula:

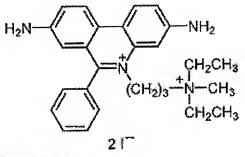
$C_{27}H_{34}I_2N_4$

Molecular Weight:

668.4

CAS Name/Number:

Phenanthridinium, 3,8-diamino-5-[3-(diethylmethylammonio)propyl]-6-phenyl-, diiodide/ 25535-16-



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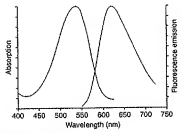
Fluorescence Spectra

Propidium iodide/DNA

Absorption and fluorescence emission spectra of propidium iodide bound to DNA.



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Documents

Manuals & Protocols

- Propidium Iodide Nucleic Acid Stain
- Alexa Fluor® 488 Annexin V/Dead Cell Apoptosis Kit

Material Safety Data Sheets (MSDS)

- P1304MP

Certificates of Analysis (COA)

Molecular Probes Handbook

- Probes for the Nucleus—Section 12.5
- Nucleic Acid Stains—Section 8.1
- Polar Tracers—Section 14.3
- Viability and Cytotoxicity Assay Reagents—Section 15.2

Additional Information

Citations & References (1120)

- **Lack of p21 expression links cell cycle control and appendage regeneration in mice.**

Authors
Bedelbaeva K, Snyder A, Gourevitch D, Clark L, Zhang XM, Leferovich J, Cheverud JM, Lieb
Journal
Proc Natl Acad Sci U S A (2010) 107:5845-5850
Product Usage
Flow cytometric analysis of cell cycle progression in fibroblast-like cells from MRL mice.
ID:
PN68689

- **Communication via gap junctions underlies early functional and beneficial interactions b host.**

Authors
Jäderstad J, Jäderstad LM, Li J, Chintawar S, Salto C, Pandolfo M, Ourednik V, Teng YD, Sidı
Journal
Proc Natl Acad Sci U S A (2010) 107:5184-5189
Product Usage
Analysis of gap junction connectivity in cultured neural stem cells.
ID:
PN68236

- **Conventional apoptosis assays using propidium iodide generate a significant number of fa assessment of cell death.**

Authors
Rieger AM, Hall BE, Luong le T, Schang LM, Barreda DR,
Journal
J Immunol Methods (2010) 358:81-92
Product Usage
Assessment of false positive results in annexin V/propidium iodide (PI) double labeling protoc RNA
ID:
PN68179

- **High-content screening for biofilm assays.**

Authors
Peng F, Hoek EM, Damoiseaux R,
Journal
J Biomol Screen (2010) 15:748-754
Product Usage
High-content imaging assessment of biofilm formation and removal on engineered surfaces.
ID:
PN68697

- **Analysis of plasma membrane integrity by fluorescent detection of Tl(+) uptake.**

Authors
Bowman AM, Nesin OM, Pakhomova ON, Pakhomov AG,
Journal
J Membr Biol (2010) 236:15-26
Product Usage
Detection of membrane nanopores produced by ultrashort electric pulses.
ID:
PN68287

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S10274
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(USD)

LIVE/DEAD® Fixable Red Dead Cell Stain Kit *for 488 nm excitation* *200 assays*

Cat #
L23102
Size
1 kit
List Price
243.00
(USD)

SYTO® 60 red fluorescent nucleic acid stain - 5 mM solution in DMSO

Cat #
S11342
Size
250 µl
List Price
189.00
(USD)

Product Categories

- Nucleic Acid Cell Stains

Related Applications

- Cell Structure
- Cell Tracing & Tracking
- Cell Viability, Proliferation & Function
- Cellular Imaging & Microscopy
- Chromatin Biology

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Related Products

- Nuclear Probes
- Structural Probes

Fluorescent and Biotinylated Dextrans—Section 14.5

Page Contents

Related Tables and Notes

Techniques for loading molecules into the cytoplasm—Table 14.1
Fluorescence characteristics of NeuroTrace fluorescent Nissl stains—Table 14.2
Summary of Molecular Probes lipophilic carbocyanine and aminostyryl tracers—Table 14.3
Molecular Probes dextran conjugates—Table 14.4
FluoSpheres microspheres for blood flow determination—Table 14.5
FluoSpheres blood flow and color kits—Table 14.6
FluoSpheres and TransFluoSpheres microspheres for tracing—Table 14.7
Molecular Probes europium and platinum luminescent FluoSpheres microspheres—Table 14.8

Anti–Lucifer Yellow Dye, Anti–Alexa Fluor 405/Cascade Blue Dye and Anti–Alexa Fluor 488 Dye Antibodies—Note 14.1
Fluorescent Probes for Photoconversion of Diaminobenzidine Reagents—Note 14.2
Assays of Volume Change, Membrane Fusion and Membrane Permeability—Note 14.3

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Dextrans are hydrophilic polysaccharides characterized by their moderate to high molecular weight, good water solubility and low toxicity. They are widely used as both anterograde and retrograde tracers in neurons (REF) and for many other applications. Dextrans are biologically inert due to their uncommon poly-(α-D-1,6-glucose) linkages, which render them resistant to cleavage by most endogenous cellular glycosidases. They also usually have low immunogenicity.

We offer almost 100 fluorescent and biotinylated dextran conjugates in several molecular weight ranges. Because the source and molecular weight of the dextran, as well as the net charge, degree of substitution and nature of the dye may significantly affect the application, references citing the use of Molecular Probes dextrans may not be directly applicable to dextrans obtained from other sources and should be considered guides rather than definitive protocols. In most cases, Molecular Probes fluorescent dextrans are much brighter and have higher negative charge than dextrans available from other sources. Furthermore, we use rigorous methods for removing as much unconjugated dye as practical, and then assay our dextran conjugates by thin-layer chromatography to ensure the absence of low molecular weight contaminants.

Properties of Molecular Probes Dextran Conjugates

A Wide Selection of Substituents

Molecular Probes dextrans are conjugated to biotin or a wide variety of fluorophores, including seven of our Alexa Fluor dyes (Molecular Probes dextran conjugates—Table 14.4). In particular, we would like to highlight the dextran conjugates of Alexa Fluor 488, Oregon Green and Rhodamine Green dyes, which are significantly brighter and more photostable than most fluorescein dextrans. Dextran-conjugated fluorescent indicators for calcium and magnesium ions (Fluorescent Ca2+ Indicator Conjugates—Section 19.4) and for pH (pH Indicator Conjugates—Section 20.4) are described with their corresponding ion indicators in other chapters.

Dextran Size

Molecular Probes dextrans include those with nominal molecular weights (MW) of 3000; 10,000; 40,000; 70,000; 500,000; and 2,000,000 daltons (Molecular Probes dextran conjugates—Table 14.4). Because unlabeled dextrans are polydisperse—and may become more so during the chemical processes required for their modification and purification—the actual molecular weights present in a particular sample may have a broad distribution. For example, our "3000 MW" dextran preparations contain polymers with molecular weights predominantly in the range of ~1500–3000 daltons, including the dye or other label.

Degree of Substitution of Molecular Probes Dextrans

Dextrans from other commercial sources usually have a degree of substitution of 0.2 or fewer dye molecules per dextran molecule for dextrans in the 10,000 MW range. Molecular Probes dextrans, however, typically contain 0.3–0.7 dyes per dextran in the 3000 MW range, 0.5–2 dyes per dextran in the 10,000 MW range, 2–4 dyes in the 40,000 MW range and 3–6 dyes in the 70,000 MW range. The actual degree of substitution is indicated on the product's label. If too many fluorophores are conjugated to the dextran molecule, quenching and undesired interactions with cellular components may occur. We have found our degree of substitution to be optimal for most applications, yielding dextrans that are typically much more fluorescent than the labeled dextrans available from other sources, thus permitting lower quantities to be used for intracellular tracing.

It has been reported that some commercially available fluorescein isothiocyanate (FITC) dextrans yield spurious results in endocytosis studies because of the presence of free dye or metal contamination. (REF) To overcome this problem, we remove as much of the free dye as possible by a combination of precipitation, dialysis, gel filtration and other techniques. The fluorescent dextran is then assayed by thin-layer chromatography (TLC) to ensure that it is free of low molecular weight dyes. We prepare several unique products that have two or even three different labels, including the fluoro-ruby, mini-ruby and micro-ruby dextrans, described below. Not all of the individual dextran molecules of these products are expected to have all the substituents, or to be equally fixable, particularly in conjugates of the lowest molecular weight dextrans.

Dextran Net Charge and Method of Substitution

The net charge on the dextran depends on the fluorophore and the method of preparing the conjugate. We prepare most of Molecular Probes dextrans by reacting a water-soluble amino dextran (D1860, D1861, D1862, D3330, D7144) with the succinimidyl ester of the appropriate dye, rather than reacting a native dextran with isothiocyanate derivatives such as FITC. This method provides superior amine selectivity and yields an amide linkage, which is somewhat more stable than the corresponding thioureas formed from isothiocyanates. Except for the Rhodamine Green and Alexa Fluor 488 conjugates, once the dye has been added, the unreacted amines on the dextran are capped to yield a neutral or anionic dextran. In the case of the Rhodamine Green and Alexa Fluor 488 dextrans, the unreacted amines on the dextran are not capped after dye conjugation. Thus, these dextran conjugates may be neutral, anionic or cationic. The Alexa Fluor, Cascade Blue, lucifer yellow, fluorescein and Oregon Green dextrans are intrinsically anionic, whereas most of the dextrans labeled with the zwitterionic rhodamine B, tetramethylrhodamine and Texas Red dyes are essentially neutral. To produce more highly anionic dextrans, we have developed a proprietary procedure for adding negatively charged groups to the dextran carriers; these products are designated "polyanionic" dextrans.

Dextran Fixability

Some applications require that the dextran tracer be treated with formaldehyde or glutaraldehyde for subsequent analysis. REF For these applications, we offer "lysine-fixable" versions of most of our dextran conjugates of fluorophores or biotin. These dextrans have covalently bound lysine residues that permit dextran tracers to be conjugated to surrounding biomolecules by aldehyde-mediated fixation for subsequent detection by immunohistochemical and ultrastructural techniques. We have also shown that all of our 10,000 MW Alexa Fluor dextran conjugates can be fixed with aldehyde-based fixatives; however, due to their smaller size, our Alexa Fluor 3000 MW dextran conjugates most likely will not survive fixation procedures.

Loading Cells with Dextrans and Subsequent Tissue Processing

Unless taken up by an endocytic process, dextran conjugates are membrane impermeant and usually must be loaded by relatively invasive techniques REF (Techniques for loading molecules into the cytoplasm—Table 14.1). As with the lipophilic tracers in Tracers for Membrane Labeling—Section 14.4, crystals of the dextran conjugates have been successfully loaded by simply placing them directly on some kinds of samples. REF We have found the Influx pinocytic cell-loading reagent (I14402; Chelators, Calibration Buffers, Ionophores and Cell-Loading Reagents—Section 19.8) to be useful for loading dextrans into a variety of adherent and nonadherent cells. REF Sterile filtration of dextran solutions before use with live cells is highly recommended. REF Biotin and biotinylated biomolecules with molecular weights up to >100,000 daltons are taken up by some plant cells through an endocytic pathway. REF

Our lysine-fixable dextrans and 10,000 MW Alexa Fluor dextrans can be fixed in place with formaldehyde or glutaraldehyde, permitting subsequent tissue processing, such as sectioning. A protocol has been published for embedding tissues in plastic for high-resolution characterization of neurons filled with lysine-fixable fluorescent dextrans. REF Fixation of biotinylated or fluorescent dextrans also permits the use of fluorescent- or enzyme-labeled conjugates of avidin and streptavidin (Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6, Molecular Probes avidin, streptavidin, NeutrAvidin and CaptAvidin conjugates—Table 7.23) or of anti-dye antibodies (Anti-Dye and Anti-Hapten Antibodies—Section 7.4, Anti-fluorophore and anti-hapten antibodies—Table 7.18), respectively. These techniques can amplify the signal, which is important for detecting fine structure in sections or for changing the detection mode. REF We provide antibodies to the Alexa Fluor 488, Alexa Fluor 405/Cascade Blue, lucifer yellow, fluorescein, BODIPY FL, tetramethylrhodamine and Texas Red fluorophores and to the 2,4-dinitrophenyl (DNP) and nitrotyrosine haptens (Anti-Dye and Anti-Hapten Antibodies—Section 7.4).

Photoconversion of neurons labeled with lysine-fixable fluorescent dextrans in the presence of diaminobenzidine (DAB) using the Diaminobenzidine (DAB) Histochemistry Kits (Secondary Immunoreagents—Section 7.2, Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6) can be used to produce electron-dense products for electron microscopy REF (Fluorescent Probes for Photoconversion of Diaminobenzidine Reagents—Note 14.2). Electron-dense products can also be generated from peroxidase or colloidal gold conjugates of avidin, streptavidin or anti-dye antibodies. REF NANOGOLD and Alexa Fluor FluoroNanogold conjugates of secondary antibodies (Secondary Immunoreagents—Section 7.2) and streptavidin (Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6) can be utilized to allow detection of labeled dextrans in fixed-cell preparations by light microscopy or, following silver enhancement with the LI Silver Enhancement Kit (L24919, Secondary Immunoreagents—Section 7.2), by electron microscopy.

Neuronal Tracing with Dextrans

Fluorescent and biotinylated dextrans are routinely employed to trace neuronal projections. Dextrans can function efficiently as anterograde or retrograde tracers, REF depending on the study method and tissue type used. Active transport of dextrans occurs only in live, not fixed tissue. REF Comparative studies of rhodamine isothiocyanate, rhodamine B dextran (D1824) and lysinated tetramethylrhodamine dextran (fluoro-ruby, D1817) have shown that the dextran conjugates produce less diffusion at injection sites and more permanent labeling than do the corresponding free dyes. REF Dextran conjugates with molecular weights up to 70,000 daltons have been employed as neuronal tracers in a wide variety of species. The availability of fluorescent dextran conjugates with different sizes and charges permitted the analysis of direction and rate of axonal transport in the squid giant axon. REF

Multilabeled Dextrans

Molecular Probes fixable dextrans, most of which are lysinated dextrans (see the products marked by a single dagger (†) in Molecular Probes dextran conjugates—Table 14.4), are generally preferred for neuronal tracing because they may transport more effectively and can be fixed in place with aldehydes after labeling. We prepare a number of multilabeled dextrans that are fixable, including some that have acquired the distinction of unique names in various publications:

Fluoro-ruby REF—a red-orange–fluorescent, aldehyde-fixable 10,000 MW dextran labeled with both tetramethylrhodamine and lysine (D1817). 3000 MW, 70,000 MW and 2,000,000 MW versions of fluoro-ruby are also available (D3308, D1818, D7139).

Fluoro-emerald REF—a green-fluorescent, aldehyde-fixable 10,000 MW dextran labeled with both fluorescein and lysine (D1820; , ,). This labeled dextran is also available in molecular weights from 3000 daltons up to 2,000,000 daltons REF (D3306, D1845, D1822, D7136, D7137).

Micro-ruby (D7162) **and mini-ruby** REF (D3312)—red-orange–fluorescent, aldehyde-fixable 3000 MW and 10,000 MW dextrans simultaneously labeled with tetramethylrhodamine, biotin and lysine.

Micro-emerald (D7156) **and mini-emerald** (D7178)—green-fluorescent, aldehyde-fixable dextrans simultaneously labeled with fluorescein, biotin and lysine.

Biotinylated dextran amine (BDA) REF—nonfluorescent, aldehyde-fixable dextrans simultaneously labeled with biotin and lysine and available in several molecular weights (D1956, D1957, D7135, D7142). A useful review has been published on the BDA products. REF

Fluoro-ruby and fluoro-emerald (🔬) have been extensively employed for retrograde and anterograde neuronal tracing, REF transplantation REF and cell-lineage tracing. REF Both products can be used to photoconvert DAB into an insoluble, electron-dense reaction product. REF Like fluoro-ruby and fluoro-emerald, micro-ruby and mini-ruby are brightly fluorescent, making it easy to visualize the electrode during the injection process. DII (D282, Tracers for Membrane Labeling—Section 14.4) or other lipophilic probes in Tracers for Membrane Labeling—Section 14.4 can be used to mark the sites of microinjection. REF In addition, because these dextrans include a covalently linked biotin, filled cells can be probed with standard enzyme-labeled avidin or streptavidin conjugates or with NANOGOLD and Alexa Fluor FluoroNanogold streptavidin (Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6) to produce a permanent record of the experiment. REF Mini-ruby has proven useful for intracellular filling in fixed brain slices REF and has been reported to produce staining comparable to that achieved with lucifer yellow CH REF (L453, L682, L1177, L12926; Polar Tracers—Section 14.3). Moreover, the use of mini-ruby in conjunction with standard peroxidase-mediated avidin–biotin methods does not cause co-conversion of lipofuscin granules found in adult human brain, a common problem during photoconversion of lucifer yellow CH. REF The lysine-fixable micro-emerald and mini-emerald dextrans (triply labeled with fluorescein, biotin and lysine) provide a contrasting color that is better excited by the argon-ion laser of confocal laser-scanning microscopes; they have uses similar to micro-ruby and mini-ruby, respectively.

3000 MW Dextrans

The nominally 3000 MW dextrans offer several advantages over higher molecular weight dextrans, including faster axonal diffusion and greater access to peripheral cell processes REF (🔬). Our "3000 MW" dextran preparations contain polymers with molecular weight predominantly in the range of ~1500–3000 daltons, including the dye or other label. Our selection of 3000 MW dextrans includes Alexa Fluor, fluorescein, Rhodamine Green, tetramethylrhodamine, Texas Red and biotin conjugates. We also offer lysine-fixable 3000 MW dextrans that are simultaneously labeled with both fluorescein and biotin (micro-emerald, D7156) or tetramethylrhodamine and biotin (micro-ruby, D7162).

The 3000 MW fluorescein dextran and tetramethylrhodamine dextran (D3306, D3308; 🔬 🔬) have been observed to readily undergo both anterograde and retrograde movement in live cells. REF These 3000 MW dextrans appear to passively diffuse within the neuronal process, as their intracellular transport is not effectively inhibited by colchicine or nocodazole, both of which disrupt active transport by depolymerizing microtubules. REF Moreover, these small dextrans diffuse at rates equivalent to those of smaller tracers such as sulforhodamine 101 and biocytin (~2 millimeters/hour at 22°C) and about as fast as 10,000 MW dextrans. The relatively low molecular weight of the dextrans may result in transport of some labeled probes through gap junctions (see below). The signal from tetramethylrhodamine-conjugated dextrans can be detected in the fine dendritic configuration of cortical projection neurons using anti-tetramethylrhodamine antibodies (A6397, Anti-Dye and Anti-Hapten Antibodies—Section 7.4) and peroxidase–anti-peroxidase complex staining. REF

NeuroTrace BDA-10,000 Neuronal Tracer Kit

The NeuroTrace BDA-10,000 Neuronal Tracer Kit (N7167) contains convenient amounts of each of the components required for neuroanatomical tracing using BDA methods. REF including:

- Lysine-fixable, biotinylated 10,000 MW dextran amine (BDA-10,000)
- Horseradish peroxidase avidin (HRP avidin)
- 3,3'-Diaminobenzidine (DAB)
- Rigorously tested protocols for fast and simple tracing experiments (NeuroTrace BDA-10,000 Neuronal Tracer Kit)

The neuronal tracer BDA-10,000 is transported over long distances and fills fine processes bidirectionally, including boutons in the anterograde direction and dendritic structures in the retrograde direction. REF Two days to two weeks after BDA-10,000 is injected into the desired region of the brain, the brain tissue can be fixed and sectioned. BDA-10,000 can also be applied to cut nerves and allowed to transport. Following incubation with HRP avidin and then DAB, the electron-dense DAB reaction product can be viewed by either light or electron microscopy REF (🔬). The NeuroTrace BDA-10,000 labeling method can be readily combined with other anterograde or retrograde labeling methods or with immunohistochemical techniques. BDA-10,000 is available as a separate product (D1956), as are BDA derivatives with other molecular weights—BDA-3000 REF (D7135), BDA-70,000 (D1957) and BDA-500,000 (D7142). A detailed protocol that utilizes Molecular Probes BDA-10,000 probe, HRP streptavidin (S911, Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6) and tetramethylbenzidine to anterogradely label fine processes in neurons has been published. REF

Cell Lineage Tracing with Dextrans

Fluorescent dextrans—particularly the fluorescein and rhodamine conjugates—have been used extensively for tracing cell lineage. REF Our Alexa Fluor 647 and Alexa Fluor 680 dextrans (D22914, D34680, D34681) provide longer-wavelength detection options for specimens with high levels of autofluorescence or low transparency. In this technique, the dextran is microinjected into a single cell of the developing embryo, and the fate of that cell and its daughters can be followed *in vivo* (🔬). The lysine-fixable tetramethylrhodamine and Texas Red dextran conjugates (Molecular Probes dextran conjugates—Table 14.4) are most frequently cited for lineage tracing studies. As a second color, particularly in combination with the Texas Red dextrans, researchers have most often used Molecular Probes lysine-fixable fluorescein dextrans REF (e.g., D3305, D1820, D1822). Although these fixable conjugates can be employed with long-term preservation of the tissue, some researchers prefer to co-inject a fluorescent, nonlysinated dextran along with a nonfluorescent, lysine-fixable biotin dextran (BDA). The nonfluorescent BDA can then be fixed in place with aldehyde-based fixatives and probed with any of our fluorescent or enzyme-labeled streptavidin and avidin conjugates described in Avidin, Streptavidin, NeutrAvidin and CaptAvidin Biotin-Binding Proteins and Affinity Matrices—Section 7.6 (Molecular Probes avidin, streptavidin, NeutrAvidin and CaptAvidin conjugates —Table 7.23).

Our 500,000 and 2,000,000 MW fluorescent dextrans (Molecular Probes dextran conjugates—Table 14.4) may be particularly useful for lineage tracing at early stages of development, although these biopolymers have lower water solubility and a greater tendency to precipitate or clog microinjection needles than our lower molecular weight dextrans. Some studies suggest that lower molecular weight dextrans may leak from blastomeres, complicating analysis. Injection of 2,000,000 MW fluorescein dextran and 2,000,000 MW Texas Red dextran into separate cells of the two-cell stage zebrafish embryo allowed the construction of a fate map. REF The 500,000 MW and 2,000,000 MW dextrans are labeled with fluorescein, tetramethylrhodamine or Texas Red dyes or with biotin, and all contain aldehyde-fixable lysine groups. The nonfluorescent 500,000 MW aminodextran (D7144) can be conjugated with the researcher's choice of amine-reactive reagents. REF

Studying Intercellular Communication with Dextrans

The size of dextrans can be exploited to study connectivity between cells. REF Examples include studies of the passage of 3000 MW dextrans through plasmodesmata REF and modulation of gap junctional communication by transforming growth factor–β_1 and forskolin. REF However, the dispersion of molecular weights in our "3000 MW" dextran preparations, which contain polymers with total molecular weights predominantly in the range of ~1500–3000 daltons but may also contain molecules <1500 daltons, may complicate such analyses.

An important experimental approach to identifying cells that form gap junctions makes use of simultaneous introduction of the polar tracer lucifer yellow CH (~450 daltons) and a tetramethylrhodamine 10,000 MW dextran. Because low molecular weight tracers like lucifer yellow CH (L453, L12926; Polar Tracers—Section 14.3) pass through gap junctions and dextrans do not, the initially labeled cell exhibits red fluorescence, whereas cells connected through gap junctions have yellow fluorescence (REF) (**Figure 14.79**). This technique has been used to follow the loss of intercellular communication in adenocarcinoma cells,(REF) to show the re-establishment of communication during wound healing in *Drosophila* (REF) and to investigate intercellular communication at different stages in *Xenopus* embryos.(REF) Simultaneous loading of cells with two (or more) dextrans that differ in both their molecular weight and in the dye's fluorescence properties has been used to assess subcellular heterogeneities in the submicroscopic structure of cytoplasm.(REF)

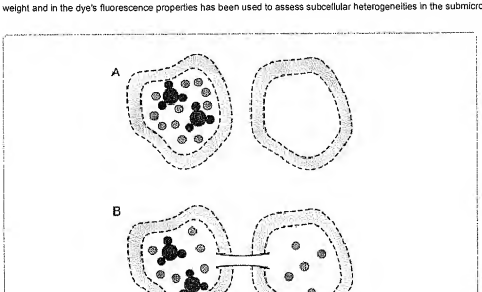

Figure 14.79 Dual-tracer technique for identifying gap junction–coupled cells. A) Cells are labeled with a mixture of a small polar tracer such as lucifer yellow CH (green circles) and a relatively large tetramethylrhodamine-labeled dextran (red circles). B) Adjoining gap junction–coupled cells are accessible to the low molecular weight tracer whereas the much larger dextran conjugate is excluded. Coupled cells with single-color lucifer yellow CH labeling are readily distinguished from initially labeled cells with dual fluorescence.

Probing Membrane Permeability with Dextrans

Labeled dextrans are often used to investigate vascular permeability and blood–brain barrier integrity.(REF) Fluorescein dextrans with molecular weights ranging from 4000 to 150,000 daltons have been used to determine the effect of electroporation variables—pulse size, shape and duration—on plasma-membrane pore size in chloroplasts,(REF) red blood cells (REF) and fibroblasts.(REF) Fluorescence recovery after photobleaching (FRAP) techniques have been used to monitor nucleocytoplasmic transport of fluorescent dextrans of various molecular weights, allowing the determination of the size-exclusion limit of the nuclear pore membrane,(REF) as well as to study the effect of epidermal growth factor and insulin on the nuclear membrane and on nucleocytoplasmic transport.(REF)

Microinjected 3000 MW fluorescent dextrans concentrate in interphase nuclei of *Drosophila* embryos, whereas 40,000 MW dextrans remain in the cytoplasm and enter the nucleus only after breakdown of the nuclear envelope during prophase. This size-exclusion phenomenon was used to follow the cyclical breakdown and reformation of the nuclear envelope during successive cell divisions.(REF) Similarly, our 10,000 MW Calcium Green dextran conjugate (C3713, Fluorescent Ca2+ Indicator Conjugates—Section 19.4) was shown to diffuse across the nuclear membrane of isolated nuclei from *Xenopus laevis* oocytes, but the 70,000 MW and 500,000 MW conjugates could not.(REF) Significantly, depletion of nuclear Ca^{2+} stores by Inositol 1,4,5-triphosphate (Ins 1,4,5-P_3, I3716; Calcium Regulation—Section 17.2) or by calcium chelators (Chelators, Calibration Buffers, Ionophores and Cell-Loading Reagents—Section 19.8) blocked nuclear uptake of the 10,000 MW Calcium Green dextran conjugate but not entry of lucifer yellow CH. Our 3000 MW Calcium Green dextran conjugate (C6765) is actively transported in adult nerve fibers over a significant distance and is retained in presynaptic terminals in a form that allows monitoring of presynaptic Ca^{2+} levels.(REF)

Following Endocytosis with Dextrans

Fluorescent Dextrans

Tracing internalization of extracellularly introduced fluorescent dextrans is a standard method for analyzing fluid-phase endocytosis.(REF) We offer dextrans with nominal molecular weights ranging from 3000 to 2,000,000 daltons, many of which can also be used as pinocytosis or phagocytosis markers (Molecular Probes dextran conjugates—Table 14.4). Discrimination of internalized fluorescent dextrans from dextrans in the growth medium is facilitated by use of reagents that quench the fluorescence of the external probe. For example, most of our anti-fluorophore antibodies (Anti-Dye and Anti-Hapten Antibodies—Section 7.4, Anti-fluorophore and anti-hapten antibodies—Table 7.19) strongly quench the fluorescence of the corresponding dyes.(REF)

Negative staining produced by fluorescent dextrans that have been intracellularly infused via a patch pipette is indicative of nonendocytic vacuoles in live pancreatic acinar cells; extracellular addition of a second, color-contrasting dextran then allows discrimination of endocytic and nonendocytic vacuoles.(REF) An *in vitro* assay for homotypic fusion of early endosomes has been described in which two cell populations are labeled with Alexa Fluor 488 and Alexa Fluor 594 10,000 MW dextrans (D22910,D22914) by fluid phase uptake, followed by subcellular fractionation and analysis of endosomal fluorescence colocalization.(REF) Intracellular fusion of endosomes has also been monitored with a BODIPY FL avidin conjugate by following the fluorescence enhancement that occurs when it complexes with a biotinylated dextran.(REF)

pH Indicator Dextrans

Some of the dyes we use to prepare Molecular Probes dextran conjugates exhibit fluorescence that is sensitive to the pH of the medium; pH indicator dextrans and their optical responses are described in detail in pH Indicator Conjugates—Section 20.4. Consequently, internalization of labeled dextrans into acidic organelles of cells can often be tracked by measuring changes in the fluorescence of the dye. The fluorescein dextrans (pK_a ~6.4) are frequently used to investigate endocytic acidification. REF Fluorescence of fluorescein-labeled dextrans is strongly quenched upon acidification; however, fluorescein's lack of a spectral shift in acidic solution makes it difficult to discriminate between an internalized probe that is quenched and residual fluorescence of the external medium. Dextran conjugates that either shift their emission spectra in acidic environments, such as the SNARF dextrans (pH Indicator Conjugates—Section 20.4), or undergo significant shifts of their excitation spectra, such as BCECF and Oregon Green dextrans (pH Indicator Conjugates—Section 20.4), provide alternatives to fluorescein. The Oregon Green 488 and Oregon Green 514 dextrans exhibit a pK_a of approximately 4.7, facilitating measurements in acidic environments. REF In addition to these pH indicator dextrans, we prepare a dextran that is double -labeled with fluorescein and tetramethylrhodamine (D1851; pH Indicator Conjugates—Section 20.4), which has been used as a ratiometric indicator (**Figure 20.28**) to measure endosomal acidification in Hep G2 cells REF and murine alveolar macrophages. REF

In contrast to fluorescein and Oregon Green 488 dextrans, pHrodo 10,000 MW dextran (P10361) exhibits increasing fluorescence in response to acidification REF (**Figure 16.47**). The minimal fluorescent signal from pHrodo dextran at neutral pH prevents the detection of noninternalized and nonspecifically bound conjugates and eliminates the need for quenching reagents and extra wash steps, thus providing a simple fluorescent assay for endocytic activity. pHrodo dextran's excitation and emission maxima of 560 and 585 nm, respectively, facilitate multiplexing with other fluorophores including blue-, green- and far-red–fluorescent probes. Although pHrodo dextran is optimally excited at approximately 560 nm, it is also readily excited by the 488 nm spectral line of the argon-ion laser found on flow cytometers, confocal microscopes and imaging microplate readers (**Figure 16.48**).

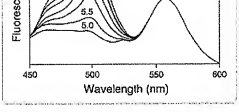

Figure 20.28 The excitation spectra of double-labeled fluorescein-tetramethylrhodamine dextran (D1851), which contains pH-dependent (fluorescein) and pH-independent (tetramethylrhodamine) dyes.

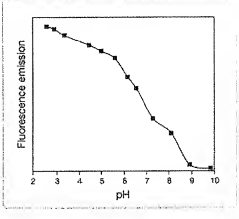

Figure 16.47 The pH response profile of pHrodo dextran (P10361) monitored at excitation/emission wavelengths of 545/590 nm in a fluorescence microplate reader. Citrate, MOPS and borate buffers were used to span the pH range from 2.5 to 10.

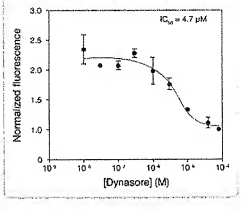

Figure 16.48 Tracking endocytosis inhibition with pHrodo dextran conjugates. HeLa cells were plated in 96-well format and treated with dynasore for 3 hours at 37°C prior to the pHrodo endocytosis assay. Next, 40 µg/mL of pHrodo 10,000 MW dextran (P10361) was incubated for 30 minutes at 37°C, and cells were then stained with HCS NuclearMask Blue Stain (H10325) for 10 minutes to reveal total cell number and demarcation for image analysis. Images were acquired on the BD Pathway 855 High-Content Bioimager (BD Biosciences).

Tracing Fluid Transport with Dextrans

Fluorescent dextrans are important tools for studying the hydrodynamic properties of the cytoplasmic matrix. The intracellular mobility of these fluorescent tracers can be investigated using fluorescence recovery after photobleaching (FRAP) techniques. We offer a range of dextran sizes, thus providing a variety of hydrodynamic radii for investigating both the nature of the cytoplasmic matrix and the permeability of the surrounding membrane. Because of their solubility and biocompatibility, fluorescent dextrans have been used to monitor in vivo tissue permeability and flow in the uveoscleral tract,[REF] capillaries [REF] and proximal tubules,[REF] as well as diffusion of high molecular weight substances in the brain's extracellular environment. [REF]

Ordering Information

Sku	Product Catalog	Size	Price	Quantity
D-1816	dextran, tetramethylrhodamine, 10,000 MW, neutral	25 mg	140.00 USD	
D-1817	dextran, tetramethylrhodamine, 10,000 MW, lysine fixable (fluoro-ruby)	25 mg	189.00 USD	
D-1818	dextran, tetramethylrhodamine, 70,000 MW, lysine fixable	25 mg	189.00 USD	
D-1819	dextran, tetramethylrhodamine, 70,000 MW, neutral	25 mg	140.00 USD	
D-1820	dextran, fluorescein, 10,000 MW, anionic, lysine fixable (fluoro-emerald)	25 mg	189.00 USD	
D-1821	dextran, fluorescein, 10,000 MW, anionic	25 mg	140.00 USD	
D-1822	dextran, fluorescein, 70,000 MW, anionic, lysine fixable	25 mg	189.00 USD	
D-1823	dextran, fluorescein, 70,000 MW, anionic	25 mg	140.00 USD	
D-1824	dextran, rhodamine B, 10,000 MW, neutral	25 mg	140.00 USD	
D-1825	dextran, lucifer yellow, 10,000 MW, anionic, lysine fixable	25 mg	140.00 USD	
D-1828	dextran, Texas Red®, 10,000 MW, neutral	25 mg	142.00 USD	
D-1829	dextran, Texas Red®, 40,000 MW, neutral	25 mg	140.00 USD	
D-1830	dextran, Texas Red®, 70,000 MW, neutral	25 mg	140.00 USD	
D-1841	dextran, rhodamine B, 70,000 MW, neutral	25 mg	140.00 USD	
D-1842	dextran, tetramethylrhodamine, 40,000 MW, neutral	25 mg	140.00 USD	
D-1844	dextran, fluorescein, 40,000 MW, anionic	25 mg	140.00 USD	
D-1845	dextran, fluorescein, 40,000 MW, anionic, lysine fixable	25 mg	189.00 USD	
D-1860	dextran, amino, 10,000 MW	1 g	131.00 USD	
D-1861	dextran, amino, 40,000 MW	1 g	131.00 USD	
D-1862	dextran, amino, 70,000 MW	1 g	131.00 USD	
D-1863	dextran, Texas Red®, 10,000 MW, lysine fixable	25 mg	189.00 USD	
D-1864	dextran, Texas Red®, 70,000 MW, lysine fixable	25 mg	189.00 USD	
D-1868	dextran, tetramethylrhodamine, 10,000 MW, anionic, fixable	25 mg	140.00 USD	
D-1956	dextran, biotin, 10,000 MW, lysine fixable (BDA-10,000)	25 mg	189.00 USD	
D-1957	dextran, biotin, 70,000 MW, lysine fixable (BDA-70,000)	25 mg	189.00 USD	
D-1976	dextran, Cascade Blue®, 10,000 MW, anionic, lysine fixable	25 mg	189.00 USD	
D-22910	dextran, Alexa Fluor® 488; 10,000 MW, anionic, fixable	5 mg	258.00 USD	
D-22911	dextran, Alexa Fluor® 546; 10,000 MW, anionic, fixable	5 mg	258.00 USD	
D-22912	dextran, Alexa Fluor® 568; 10,000 MW, anionic, fixable	5 mg	258.00 USD	
D-22913	dextran, Alexa Fluor® 594; 10,000 MW, anionic, fixable	5 mg	258.00 USD	
D-22914	dextran, Alexa Fluor® 647; 10,000 MW, anionic, fixable	2 mg	140.00 USD	
D-3305	dextran, fluorescein, 3000 MW, anionic	10 mg	189.00 USD	
D-3306	dextran, fluorescein, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD	

D-3307	dextran, tetramethylrhodamine, 3000 MW, anionic	10 mg	189.00 USD	
D-3308	dextran, tetramethylrhodamine, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD	
D-3312	dextran, tetramethylrhodamine and biotin, 10,000 MW, lysine fixable (mini-ruby)	10 mg	258.00 USD	
D-3328	dextran, Texas Red®, 3000 MW, lysine fixable	10 mg	214.00 USD	
D-3329	dextran, Texas Red®, 3000 MW, neutral	10 mg	189.00 USD	
D-3330	dextran, amino, 3000 MW	100 mg	95.50 USD	
D34679	dextran, Alexa Fluor® 555; 10,000 MW, anionic, fixable	5 mg	274.00 USD	
D34680	dextran, Alexa Fluor® 680; 10,000 MW, anionic, fixable	5 mg	274.00 USD	
D34681	dextran, Alexa Fluor® 680; 3,000 MW, anionic	2 mg	160.00 USD	
D34682	dextran, Alexa Fluor® 488; 3,000 MW, anionic	2 mg	160.00 USD	
D-7132	dextran, Cascade Blue®, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD	
D-7135	dextran, biotin, 3000 MW, lysine fixable (BDA-3000)	10 mg	214.00 USD	
D-7136	dextran, fluorescein, 500,000 MW, anionic, lysine fixable	10 mg	189.00 USD	
D-7137	dextran, fluorescein, 2,000,000 MW, anionic, lysine fixable	10 mg	189.00 USD	
D-7139	dextran, tetramethylrhodamine, 2,000,000 MW, lysine fixable	10 mg	189.00 USD	
D-7142	dextran, biotin, 500,000 MW, lysine fixable (BDA-500,000)	10 mg	189.00 USD	
D-7144	dextran, amino, 500,000 MW	100 mg	95.50 USD	
D-7153	dextran, Rhodamine Green™, 10,000 MW, lysine fixable	10 mg	258.00 USD	
D-7156	dextran, fluorescein and biotin, 3000 MW, anionic, lysine fixable (micro-emerald)	5 mg	258.00 USD	
D-7162	dextran, tetramethylrhodamine and biotin, 3000 MW, lysine fixable (micro-ruby)	5 mg	258.00 USD	
D-7163	dextran, Rhodamine Green™, 3000 MW	5 mg	325.00 USD	
D-7168	dextran, BODIPY® FL, 10,000 MW, fixable	5 mg	189.00 USD	
D-7170	dextran, Oregon Green® 488; 10,000 MW, anionic	5 mg	189.00 USD	
D-7171	dextran, Oregon Green® 488; 10,000 MW, anionic, lysine fixable	5 mg	214.00 USD	
D-7172	dextran, Oregon Green® 488; 70,000 MW, anionic	5 mg	189.00 USD	
D-7173	dextran, Oregon Green® 488; 70,000 MW, anionic, lysine fixable	5 mg	214.00 USD	
D-7176	dextran, Oregon Green® 514; 70,000 MW, anionic	5 mg	189.00 USD	
D-7178	dextran, fluorescein and biotin, 10,000 MW, anionic, lysine fixable (mini-emerald)	10 mg	267.00 USD	
N-7167	NeuroTrace® BDA-10,000 Neuronal Tracer Kit	1 kit	259.00 USD	
P10361	dextran, pHrodo™ 10,000 MW for endocytosis	0.5 mg	265.00 USD	
V-22915	Vybrant® Cell Lineage Tracing Kit	1 kit	141.00 USD	

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D-1818	dextran, tetramethylrhodamine, 70,000 MW, lysine fixable	25 mg	189.00 USD
D-1819	dextran, tetramethylrhodamine, 70,000 MW, neutral	25 mg	140.00 USD
D-1820	dextran, fluorescein, 10,000 MW, anionic, lysine fixable (fluoro-emerald)	25 mg	189.00 USD
D-1821	dextran, fluorescein, 10,000 MW, anionic	25 mg	140.00 USD
D-1822	dextran, fluorescein, 70,000 MW, anionic, lysine fixable	25 mg	189.00 USD
D-1823	dextran, fluorescein, 70,000 MW, anionic	25 mg	140.00 USD
D-1824	dextran, rhodamine B, 10,000 MW, neutral	25 mg	140.00 USD
D-1825	dextran, lucifer yellow, 10,000 MW, anionic, lysine fixable	25 mg	140.00 USD
D-1828	dextran, Texas Red®, 10,000 MW, neutral	25 mg	142.00 USD
D-1829	dextran, Texas Red®, 40,000 MW, neutral	25 mg	140.00 USD
D-1830	dextran, Texas Red®, 70,000 MW, neutral	25 mg	140.00 USD
D-1841	dextran, rhodamine B, 70,000 MW, neutral	25 mg	140.00 USD
D-1842	dextran, tetramethylrhodamine, 40,000 MW, neutral	25 mg	140.00 USD
D-1844	dextran, fluorescein, 40,000 MW, anionic	25 mg	140.00 USD
D-1845	dextran, fluorescein, 40,000 MW, anionic, lysine fixable	25 mg	189.00 USD
D-1860	dextran, amino, 10,000 MW	1 g	131.00 USD
D-1861	dextran, amino, 40,000 MW	1 g	131.00 USD
D-1862	dextran, amino, 70,000 MW	1 g	131.00 USD
D-1863	dextran, Texas Red®, 10,000 MW, lysine fixable	25 mg	189.00 USD
D-1864	dextran, Texas Red®, 70,000 MW, lysine fixable	25 mg	189.00 USD
D-1868	dextran, tetramethylrhodamine, 10,000 MW, anionic, fixable	25 mg	140.00 USD
D-1956	dextran, biotin, 10,000 MW, lysine fixable (BDA-10,000)	25 mg	189.00 USD
D-1957	dextran, biotin, 70,000 MW, lysine fixable (BDA-70,000)	25 mg	189.00 USD
D-1976	dextran, Cascade Blue®, 10,000 MW, anionic, lysine fixable	25 mg	189.00 USD
D-22910	dextran, Alexa Fluor® 488; 10,000 MW, anionic, fixable	5 mg	258.00 USD
D-22911	dextran, Alexa Fluor® 546; 10,000 MW, anionic, fixable	5 mg	258.00 USD
D-22912	dextran, Alexa Fluor® 568; 10,000 MW, anionic, fixable	5 mg	258.00 USD
D-22913	dextran, Alexa Fluor® 594; 10,000 MW, anionic, fixable	5 mg	258.00 USD
D-22914	dextran, Alexa Fluor® 647; 10,000 MW, anionic, fixable	2 mg	140.00 USD
D-3305	dextran, fluorescein, 3000 MW, anionic	10 mg	189.00 USD

D-3306	dextran, fluorescein, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD
D-3307	dextran, tetramethylrhodamine, 3000 MW, anionic	10 mg	189.00 USD
D-3308	dextran, tetramethylrhodamine, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD
D-3312	dextran, tetramethylrhodamine and biotin, 10,000 MW, lysine fixable (mini-ruby)	10 mg	258.00 USD
D-3328	dextran, Texas Red®, 3000 MW, lysine fixable	10 mg	214.00 USD
D-3329	dextran, Texas Red®, 3000 MW, neutral	10 mg	189.00 USD
D-3330	dextran, amino, 3000 MW	100 mg	95.50 USD
D34679	dextran, Alexa Fluor® 555; 10,000 MW, anionic, fixable	5 mg	274.00 USD
D34680	dextran, Alexa Fluor® 680; 10,000 MW, anionic, fixable	5 mg	274.00 USD
D34681	dextran, Alexa Fluor® 680; 3,000 MW, anionic	2 mg	160.00 USD
D34682	dextran, Alexa Fluor® 488; 3,000 MW, anionic	2 mg	160.00 USD
D-7132	dextran, Cascade Blue®, 3000 MW, anionic, lysine fixable	10 mg	214.00 USD
D-7135	dextran, biotin, 3000 MW, lysine fixable (BDA-3000)	10 mg	214.00 USD
D-7136	dextran, fluorescein, 500,000 MW, anionic, lysine fixable	10 mg	189.00 USD
D-7137	dextran, fluorescein, 2,000,000 MW, anionic, lysine fixable	10 mg	189.00 USD
D-7139	dextran, tetramethylrhodamine, 2,000,000 MW, lysine fixable	10 mg	189.00 USD
D-7142	dextran, biotin, 500,000 MW, lysine fixable (BDA-500,000)	10 mg	189.00 USD
D-7144	dextran, amino, 500,000 MW	100 mg	95.50 USD
D-7153	dextran, Rhodamine Green™, 10,000 MW, lysine fixable	10 mg	258.00 USD
D-7156	dextran, fluorescein and biotin, 3000 MW, anionic, lysine fixable (micro-emerald)	5 mg	258.00 USD
D-7162	dextran, tetramethylrhodamine and biotin, 3000 MW, lysine fixable (micro-ruby)	5 mg	258.00 USD
D-7163	dextran, Rhodamine Green™, 3000 MW	5 mg	325.00 USD
D-7168	dextran, BODIPY® FL, 10,000 MW, fixable	5 mg	189.00 USD
D-7170	dextran, Oregon Green® 488; 10,000 MW, anionic	5 mg	189.00 USD
D-7171	dextran, Oregon Green® 488; 10,000 MW, anionic, lysine fixable	5 mg	214.00 USD
D-7172	dextran, Oregon Green® 488; 70,000 MW, anionic	5 mg	189.00 USD
D-7173	dextran, Oregon Green® 488; 70,000 MW, anionic, lysine fixable	5 mg	214.00 USD
D-7176	dextran, Oregon Green® 514; 70,000 MW, anionic	5 mg	189.00 USD
D-7178	dextran, fluorescein and biotin, 10,000 MW, anionic, lysine fixable (mini-emerald)	10 mg	257.00 USD
N-7167	NeuroTrace® BDA-10,000 Neuronal Tracer Kit	1 kit	259.00 USD
P10361	dextran, pHrodo™ 10,000 MW for endocytosis	0.5 mg	265.00 USD
V-22915	Vybrant® Cell Lineage Tracing Kit	1 kit	141.00 USD